

PCM-7130

**Intel StrongARM SA1110-based
Single Board Computer with
Windows CE.NET**

Users Manual

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This manual is for the PCM-7130.

Part No. 200671300
1st Edition: August, 2002

Packing List

Before you begin installing your card, please make sure that the following materials have been shipped:

- Support CD
- Windows CE end user license agreement
- USB client ActiveSync cable
- Y-shaped adapter for PS/2 mouse and keyboard
- Audio cable
- RS-232 and RS-485 combo cable

If any of these items are missing or damaged, contact your distributor or sales representative immediately.

Additional Information and Assistance

Step 1. Visit the Advantech web site at **www.advantech.com/risc** where you can find the latest information about the product.

Step 2. Contact your distributor, sales representative, or Advantech's customer service center for technical support if you need additional assistance. Please have the following information ready before you call:

- Product name and serial number
- Description of your peripheral attachments
- Description of your software (operating system, version, application software, etc.)
- A complete description of the problem
- The exact wording of any error messages

FCC Class A

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential environment. This equipment generates, uses and can radiate radio frequency energy. If not installed and used in accordance with this user's manual, it may cause harmful interference to radio communications. Note that even when this equipment is installed and used in accordance with this user's manual, there is still no guarantee that interference will not occur. If this equipment is believed to be causing harmful interference to radio or television reception, this can be determined by turning the equipment on and off. If interference is occurring, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and the receiver
- Connect the equipment to a power outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help

Warning! *Any changes or modifications made to the equipment which are not expressly approved by the relevant standards authority could void your authority to operate the equipment.*



*Warning! Input voltage rated 12 V ~ 24 V_{dc}, 0.3 A max
(LCD excluded)*



*Packing: please carry the unit with both hands,
handle with care*

Our European representative:

Advantech Europe GmbH

Kolberger Straße 7

D-40599 Düsseldorf, Germany

Tel: 49-211-97477350

Fax: 49-211-97477300

*Maintenance: to properly maintain and clean
the surfaces, use only approved products or
clean with a dry applicator*

Safety Instructions

1. Read these safety instructions carefully.
2. Keep this User's Manual for later reference.
3. Disconnect this equipment from any AC outlet before cleaning. Use a damp cloth. Do not use liquid or spray detergents for cleaning.
4. For plug-in equipment, the power outlet socket must be located near the equipment and must be easily accessible.
5. Keep this equipment away from humidity.
6. Put this equipment on a reliable surface during installation. Dropping it or letting it fall may cause damage.
7. The openings on the enclosure are for air convection. Protect the equipment from overheating. **DO NOT COVER THE OPENINGS.**
8. Make sure the voltage of the power source is correct before connecting the equipment to the power outlet.
9. Position the power cord so that people cannot step on it. Do not place anything over the power cord.
10. All cautions and warnings on the equipment should be noted.
11. If the equipment is not used for a long time, disconnect it from the power source to avoid damage by transient overvoltage.
12. Never pour any liquid into an opening. This may cause fire or electrical shock.
13. Never open the equipment. For safety reasons, the equipment should be opened only by qualified service personnel.
14. If one of the following situations arises, get the equipment checked by service personnel:
 - a. The power cord or plug is damaged.
 - b. Liquid has penetrated into the equipment.
 - c. The equipment has been exposed to moisture.
 - d. The equipment does not work well, or you cannot get it to work according to the user's manual.
 - e. The equipment has been dropped and damaged.
 - f. The equipment has obvious signs of breakage.
15. **DO NOT LEAVE THIS EQUIPMENT IN AN ENVIRONMENT WHERE THE STORAGE TEMPERATURE MAY GO BELOW -20° C (-4° F) OR ABOVE 60° C (140° F). THIS COULD DAMAGE THE EQUIPMENT. THE EQUIPMENT SHOULD BE IN A CONTROLLED ENVIRONMENT.**
16. **CAUTION: DANGER OF EXPLOSION IF BATTERY IS INCORRECTLY REPLACED. REPLACE ONLY WITH THE SAME OR EQUIVALENT TYPE RECOMMENDED BY THE MANUFACTURER, DISCARD USED BATTERIES ACCORDING TO THE MANUFACTURER'S INSTRUCTIONS.**

The sound pressure level at the operator's position according to IEC 704-1:1982 is no more than 70 dB (A).

DISCLAIMER: This set of instructions is given according to IEC 704-1. Advantech disclaims all responsibility for the accuracy of any statements contained herein.

Wichtige Sicherheitshinweise

1. Bitte lesen Sie sich diese Hinweise sorgfältig durch.
2. Heben Sie diese Anleitung für den späteren Gebrauch auf.
3. Vor jedem Reinigen ist das Gerät vom Stromnetz zu trennen. Verwenden Sie keine Flüssig- oder Aerosolreiniger. Am besten dient ein angefeuchtetes Tuch zur Reinigung.
4. Die Netzanschlusssteckdose soll nahe dem Gerät angebracht und leicht zugänglich sein.
5. Das Gerät ist vor Feuchtigkeit zu schützen.
6. Bei der Aufstellung des Gerätes ist auf sicheren Stand zu achten. Ein Kippen oder Fallen könnte Verletzungen hervorrufen.
7. Die Belüftungsöffnungen dienen zur Luftzirkulation, die das Gerät vor Überhitzung schützt. Sorgen Sie dafür, dass diese Öffnungen nicht abgedeckt werden.
8. Beachten Sie beim Anschluss an das Stromnetz die Anschlusswerte.
9. Verlegen Sie die Netzanschlussleitung so, dass niemand darüber fallen kann. Es sollte auch nichts auf der Leitung abgestellt werden.
10. Alle Hinweise und Warnungen, die sich an den Geräten befinden, sind zu beachten.
11. Wird das Gerät über einen längeren Zeitraum nicht benutzt, sollten Sie es vom Stromnetz trennen. Somit wird im Falle einer Überspannung eine Beschädigung vermieden.
12. Durch die Lüftungsöffnungen dürfen niemals Gegenstände oder Flüssigkeiten in das Gerät gelangen. Dies könnte einen Brand bzw. elektrischen Schlag auslösen.
13. Öffnen Sie niemals das Gerät. Das Gerät darf aus Gründen der elektrischen Sicherheit nur von autorisiertem Servicepersonal geöffnet werden.
14. Wenn folgende Situationen auftreten, ist das Gerät vom Stromnetz zu trennen und von einer qualifizierten Servicestelle zu überprüfen:
 - a - Netzkabel oder Netzstecker sind beschädigt.
 - b - Flüssigkeit ist in das Gerät eingedrungen.
 - c - Das Gerät war Feuchtigkeit ausgesetzt.
 - d - Wenn das Gerät nicht der Bedienungsanleitung entsprechend funktioniert oder Sie mit Hilfe dieser Anleitung keine Verbesserung erzielen.
 - e - Das Gerät ist gefallen und/oder das Gehäuse ist beschädigt.
 - f - Wenn das Gerät deutliche Anzeichen eines Defektes aufweist.
15. **VORSICHT:** Explosionsgefahr bei unsachgemäßen Austausch der Batterie. Ersatz nur durch denselben oder einem vom Hersteller empfohlenen ähnlichen Typ. Entsorgung gebrauchter Batterien nach Angaben des Herstellers.

Der arbeitsplatzbezogene Schalldruckpegel nach DIN 45 635 Teil 1000 beträgt 70dB(A) oder weniger.

DISCLAIMER: This set of instructions is given according to IEC704-1. Advantech disclaims all responsibility for the accuracy of any statements contained herein.

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General Information

This chapter gives background information on the PCM-7130 StrongARM-based single board computer.

Sections include:

- Introduction
- Features
- Specifications
- Dimensions

Chapter 1 General Information

1.1 Introduction

The PCM-7130 is an Intel StrongARM low-power RISC processor single board computer that is designed to serve power/environment critical applications. It is integrated with Windows CE and provides complete functions. With the Windows CE operating system built into the 32 MB onboard flash memory and 64 MB DRAM, the PCM-7130 frees itself from working with hard disk drivers and therefore reduces the risk of such vulnerable devices.

Onboard features include a 10 Mbps Ethernet port, two full RS-232 and one RS-485 serial ports, AC'97 audio interface, USB host and client ports, GPIO/DIO pins and CompactFlash™/PCMCIA slots for storage or function expansions. The PCM-7130 supports LCD/CRT/TV displays up to the resolution of SVGA (800 x 600 pixels) and 4-wire resistive touch-screen as well.

The processor of the PCM-7130 is the 206 MHz Intel StrongARM SA-1110. The mili-watt power consumption by its kernel makes this SBC good for power conscious applications. System engineers can extend MTBC (mean time between chargings) of their battery more than they could expect from ordinary x86 platforms. In addition, low power consumption gives fanless operation when integrated into some systems in harsh environments. Clean, silent and longer MTBF are the obvious benefits by getting rid of fans.

The PCM-7130 operates with a Windows CE operating systems. Gaining popularity in embedded fields for several years, the Microsoft Windows CE is getting more recognition as a dependable, mission critical OS. The most frequently cited feature is its resemblance to other Windows family OSs. The Microsoft Windows family is now a major influence not only daily operations of end users, but also thousands of programmers. Windows CE.NET is bundled with the PCM-7130, and provides the maturest and most powerful capability among embedded OSs.

1.2 Features

- Ultra-compact size single board computer as small as a 3.5" hard disk drive (145 mm x 102 mm)
- On-board Intel StrongARM SA-1110 CPU
- 64 MB system memory on board (SDRAM)
- 32 MB flash memory on board (16MB for those models with Linux on board)
- Windows CE.NET OS built in the flash memory
- One 10Base-T Ethernet port
- Two RS-232 ports and one RS-485 port with automatic data flow controlling.
- One USB host and one USB client ports
- One mini-DIN PS/2 port for keyboard and mouse
- AC'97 audio interface and a buzzer
- One VGA output port for CRT monitor
- 18-bit TFT active color LCD/16-bit DSTN passive color LCD, 18-bit LVDS interface
- One CompactFlash slot
- One PCMCIA slot
- One IrDA interface
- 8 GPIO, 8 digital input and 8 digital output interfaces (3.3 V high)
- 4-wire resistive touchscreen interface
- Smart Battery interface
- One TV-out port supporting both NTSC and PAL signals

1.3 Specifications

General

- **CPU:** Onboard Intel® StrongARM SA-1110, 206 MHz
- **Flash memory:** 32 MB flash memory on board
- **Memory:** 64 MB SDRAM on board
- **Watchdog timer:** Dallas DS1670 real time clock/watchdog timer
- **Audio:** AC'97 stereo audio interface
- **Battery:** Smart Battery interface (SM bus)
- **Power consumption:** 12 V @ 0.3 A
- **Power input:** 12 V_{DC}
- **Operating system:** Microsoft® Windows CE.NET stored in the flash memory

I/O ports

- **SSD:** 1 type-II CompactFlash card slot
- **DIO:** 8 digital input (CMOS threshold with input tolerance up to 5V), 8 digital output (CMOS levels)
- **Ethernet:** 1 RJ-45 10Base-T port
- **GPIO:** 8 (CMOS levels, without 5 V input tolerance)
- **IrDA:** 1 IrDA interface
- **PCMCIA:** 1 type-II PCMCIA slot

Note: The default Windows CE.NET on the PCM-7130 includes the drivers of Advantech 11Mbps Wireless LAN PCMCIA adaptor Model: WLAN-9030. Other PCMCIA cards to be used may require additional drivers and Windows CE customization.

- **PS/2 port:** 1 PS/2 port for keyboard and mouse
- **Serial ports:** 1 full RS-232 with DB-9 connector, 1 full RS-232 and 1 automatic data flow controlling RS-485 with pin-header interface
- **USB ports:** 1 USB host port (USB 1.1) and 1 USB client port for ActiveSync

Display

- **Chipset:** Epson S1D13806 VGA controller
- **LCD interface:** 18-bit TFT active color LCD/16-bit DSTN passive color LCD, 18-bit LVDS interface

Note: Up to the date that this manual is written, the following LCDs prove to work well with the PCM-7130:

PrimeView 6.4" VGA TFT LCD (PD064VT2T1)

Nan-ya 7.4" VGA DSTN LCD (LCBLDT163M9T)

Unipac 10.4" SVGA LVDS TFT LCD (UB104S01-1)

Advantech keeps adding new LCDs into the compatibility list. Please visit Advantech website or contact local representatives for newest documents.

- **TV-out:** supports both NTSC and PAL output
- **Touchscreen:** supports 4-wire resistive touchscreen via SPI (Serial Peripheral Interface)
- **Resolution/color depth:**

<i>Table 1.1:</i>	Max. resolution	Color depth
LCD	800x600	16 bpp
CRT	800x600	16 bpp
LCD+CRT (dual view)	640x480 (LCD) & 640x480 (CRT)	8 bpp (LCD) & 8 bpp (CRT)

Environmental

- **Operating temperature:** 0~60 degree Celsius (32~140 degree Fahrenheit) fanless operation
- **Storage temperature:** -20~70 degree Celsius (4~158 degree Fahrenheit)
- **Operating humidity:** 0~90% relative humidity, non-condensing

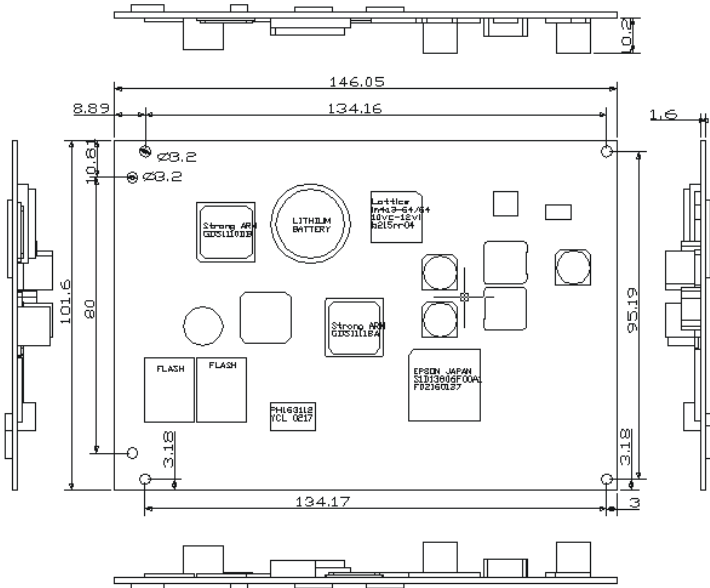


Figure 1.1: Component Side

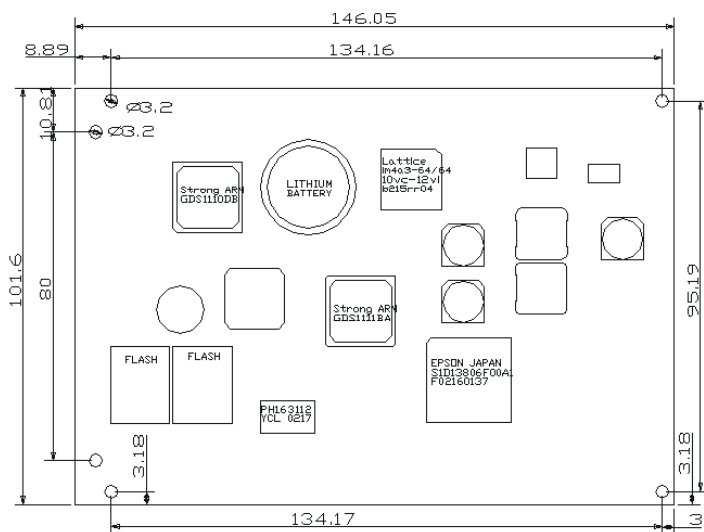


Figure 1.2: Component side

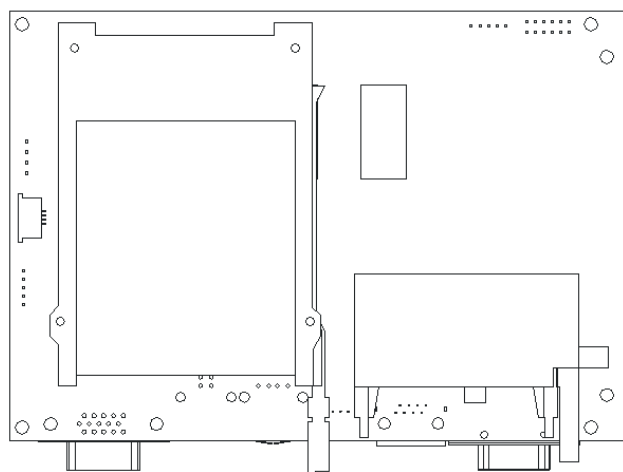


Figure 1.3: Solder side

Installation

This chapter tells how to set up the PCM-7130 hardware. It includes all connector locations and respective pin assignments. Be sure to read all the safety precautions before you begin the installation procedure.

Chapter 2 Installation

2.1 Connectors

The PCM-7130 has abundance of I/O ports and interfaces that allow you to configure your system to suit your application. The table below lists the function of each of the connectors:

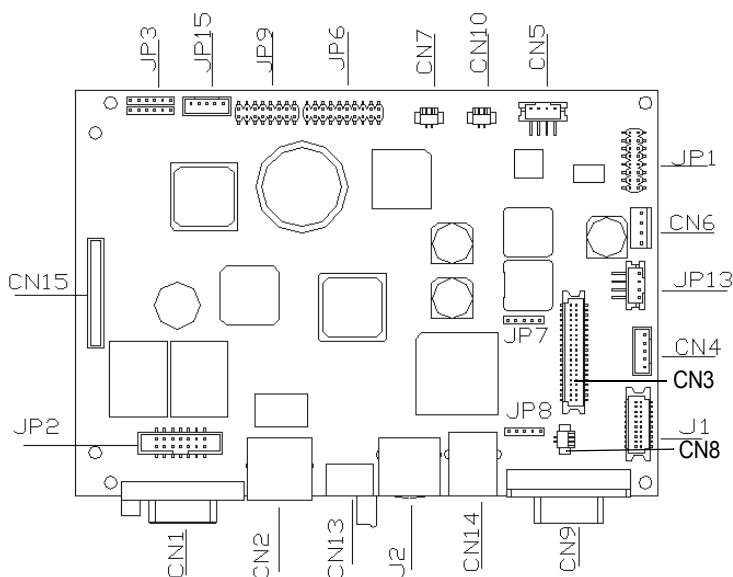


Figure 2.1: Component side of the PCM-7130

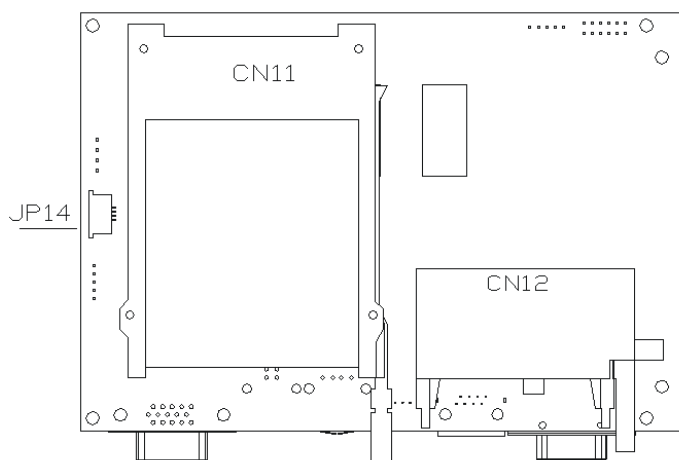


Figure 2.2: Solder side of the PCM-7130

Table 2.1 shows the list of all connector/ports on the PCM-7130.

Table 2.1: Connectors on the PCM-7130

Label	Function
CN1	COM1 (full function RS-232) serial port
JP2	COM2 (full function RS-232) and COM3 RS-485 serial ports
CN2	10Base-T Ethernet port
CN13	PS/2 keyboard and mouse connector
J2	USB client (type B) connector
CN14	USB host (type A) connector
CN9	CRT display connector
CN8	TV-out connector
CN3	40-pin LCD display connector
J1	20-pin LVDS display connector
CN4	LCD inverter connector
JP13	4-wire resistive touchscreen connector

JP14	4-wire resistive touchscreen FPC connector
CN6	DC power connector
JP1	Audio connector
CN5	Battery signals control connector
CN10	System wake-up connector
CN7	System reset connector
JP6	Digital inputs and digital output connector
JP9	Hot-key connector
JP15	IrDA connector
CN12	CompactFlash card connector
CN11	PCMCIA card connector
CN15	Expansion connector (reserved)
JP12	SA-110 JTAG*

*For more JTAG information, please visit the Advantech RISC Alliance Partner Zone web site at www.advantech.com/risc

Table 2.2: Miscellaneous

Label	Function
HP1	Buzzer
D11	Power LED
D12	CompactFlash RDY/nINT LED
D13	PCMCIA RDY/nINT LED

2.2 Pin Assignments

This section lists all the pin assignments of the connectors shown in the Table 2.1.

CN1 is the COM1 full function RS-232 serial port connector

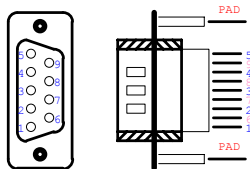


Table 2.3: COM1 RS-232 serial port (CN1)

Pin	Function
1	DCD
2	RXD
3	TXD
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
9	RI

JP2 is COM2, the full function RS-232 and COM3 RS-485 serial ports

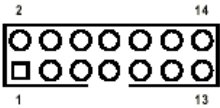


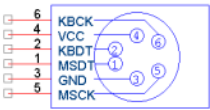
Table 2.4: COM2 RS-232 & COM3 RS-485 (JP2)

Pin	Function
1	DCD
2	DSR
3	RXD
4	RTS
5	TXD
6	CTS
7	DTR
8	RI
9	GND
10	N/C
11	DATA+ (RS-485)
12	DATA- (RS-485)
13	N/C
14	N/C

CN2: 10Base-T Ethernet port

<i>Table 2.5: 10Base-T Ethernet port (CN2)</i>	
Pin	Function
1	XMT+
2	XMT-
3	RCV+
4	N/C
5	N/C
6	RCV-
7	N/C
8	N/C

CN13: PS/2 keyboard/mouse connector



<i>Table 2.6: PS/2 keyboard/mouse connector (CN13)</i>	
Pin	Function
1	KB DATA
2	MS DATA
3	GND
4	Vcc
5	KB CLK
6	MS CLK

J2: USB client port

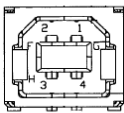


Table 2.7: USB client port (J2)

Pin	Function
1	N/C
2	USB_DATA-
3	USB_DATA+
4	GND

CN14: USB host port

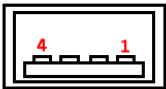


Table 2.8: USB host port (CN14)

Pin	Function
1	USBVcc (5V)
2	USB_DATA-
3	USB_DATA+
4	GND

CN9: CRT display port (VGA-out)

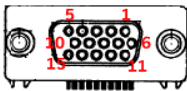


Table 2.9: CRT display port VGA-out (CN9)

Pin	Function
1	RED
2	GREEN
3	BLUE
4	N/C
5	GND
6	GND
7	GND
8	GND
9	N/C
10	GND
11	N/C
12	N/C
13	H-SYNC
14	V-SYNC
15	N/C

CN8: TV-out connector



Table 2.10: TV-out (CN8)

1	Composite video out
2	GND

CN3: 40-pin LCD connector

Table 2.11: 40-pin LCD connector (CN3)

Pin	Signal	Pin	Signal
1	VDDSAFE5	2	VDDSAFE5
3	GND	4	GND
5	VDDSAFE3	6	VDDSAFE3
7	Reserved (for Vcon)*	8	GND
9	LCD_D0	10	LCD_D1
11	LCD_D2	12	LCD_D3
13	LCD_D4	14	LCD_D5
15	LCD_D6	16	LCD_D7
17	LCD_D8	18	LCD_D9
19	LCD_D10	20	LCD_D11
21	LCD_D12	22	LCD_D13
23	LCD_D14	24	LCD_D15
25	LCD_D16	26	LCD_D17
27	LCD_D18	28	LCD_D19
29	LCD_D20	30	LCD_D21
31	LCD_D22	32	LCD_D23
33	GND	34	GND
35	SHCLK	36	FLM
37	M/DE	38	LP
39	N/C	40	ENAVEE

*Vcon default voltage=24.4 V.Vcon can be adjusted by using System Configurator.Vcon max=26.8 V, Vcon min=22.3 V. Vcon is only for STN/DSTN LCD panel

Table 2.12: LCD signal mapping

	18-bit TFT Panel	16-bit DSTN Panel
LCD_D0	GND	GND
LCD_D1	GND	GND
LCD_D2	B0	GND
LCD_D3	B1	UD7
LCD_D4	B2	UD6
LCD_D5	B3	LD4
LCD_D6	B4	UD3
LCD_D7	B5	UD2
LCD_D8	GND	GND
LCD_D9	GND	GND
LCD_D10	G0	UD5
LCD_D11	G1	UD4
LCD_D12	G2	LD7
LCD_D13	G3	UD1
LCD_D14	G4	UD0
LCD_D15	G5	LD3
LCD_D16	GND	GND
LCD_D17	GND	GND
LCD_D18	R0	GND
LCD_D19	R1	LD6
LCD_D20	R2	LD5
LCD_D21	R3	LD2
LCD_D22	R4	LD1
LCD_D23	R5	LD0

J1: 20-pin LVDS display connector

Table 2.13: 20-pin LVDS connector (J1)

Pin	Signal	Pin	Signal
1	VDD (+3V)	2	VDD (+3V)
3	GND	4	GND
5	TX0-	6	TX0+
7	GND	8	TX1-
9	TX1+	10	GND
11	TX2-	12	TX2+
13	GND	14	TX3-
15	TX3+	16	GND
17	TXCK-	18	TXCK+
19	GND	20	GND

CN4: LCD inverter connector

Table 2.14: LCD inverter connector (CN4)

Pin	Signal
1	DC_IN (+12V)
2	GND
3	ENABKL
4	VBR
5	N/C

JP13, JP14: 4-wire touchscreen connector

Table 2.15: 4-wire touchscreen connector

Pin	Signal
1	X-
2	X+
3	Y-
4	Y+

CN6: DC power connector

Table 2.16: DC power connector (CN6)

Pin	Signal
1	DC_IN (+12V)
2	GND
3	GND
4	N/C

JP1: Audio connector

Table 2.17: Audio connector (JP1)

Pin	Signal	Pin	Signal
1	SPEAKER OUT R+	2	SPEAKER OUT R-
3	SPEAKER OUT L+	4	SPEAKER OUT L-
5	LINE OUT R	6	LINE OUT L
7	GND	8	GND
9	GND	10	GND
11	GND	12	GND
13	N/C	14	N/C
15	MIC IN	16	GND

CN5: Battery signal control connector

Table 2.18: Battery signal control connector (CN5)

Pin	Signal
1	SM_CLK
2	SM_DATA
3	nDC_IN (low indicating DC power used; high indicating battery input)
4	GND

CN10: System wake-up connector

Table 2.19: System wake-up connector (CN10)

Pin	Signal
1	nWake-up in*
2	GND

*active low

CN7: System reset connector

Table 2.20: System reset connector (CN7)

Pin	Signal
1	nReset in*
2	GND

*active low

JP6: DI/DO connector

Table 2.21: DI/DO connector (JP6)

Pin	Signal	Pin	Signal
1	DI 0	2	DO 0
3	DI 1	4	DO 1
5	DI 2	6	DO 2
7	DI 3	8	DO 3
9	DI 4	10	DO 4
11	DI 5	12	DO 5
13	DI 6	14	DO 6
15	DI 7	16	DO 7
17	Vcc (+3.3V)	18	Vcc (+3.3V)
19	GND	20	GND

JP9: Hot-key connector

Table 2.22: Hot-key connector (JP9)

Pin	Signal	Pin	Signal
1	Hot key 1*	2	GND
3	Hot key 2*	4	GND
5	Hot key 3*	6	GND
7	Hot key 4*	8	GND
9	Hot key 5*	10	GND
11	Hot key 6*	12	GND
13	Hot key 7*	14	GND
15	Hot key 8*	16	GND

Note: All hot keys (GPIOs) are low active

JP15: IrDA connector

Table 2.23: IrDA connector (JP15)

Pin	Signal
1	Vcc (+3.3V)
2	N/C
3	IrDA RXD
4	GND
5	IrDA TXD

CN 15: Expansion connector

Table 2.24: Expansion connector (CN15)

Pin	Signal	Pin	Signal
1	SA1110_A0	2	nSA1110_RST_OUT*
3	SA1110_A1	4	SA1110_RD_nWR
5	SA1110_A2	6	SA1110_RDY
7	SA1110_A3	8	nSA1110_CS3*
9	SA1110_A4	10	SA1110_PWR_EN
11	SA1110_A5	12	nSA1110_IOIS16*
13	SA1110_A6	14	Reserved
15	SA1110_A7	16	Reserved
17	SA1110_A8	18	GND
19	SA1110_A9	20	+3.3V
21	SA1110_A10	22	SA1110_D15
23	SA1110_A11	24	SA1110_D14
25	SA1110_A12	26	SA1110_D13
27	SA1110_A13	28	SA1110_D12
29	SA1110_A14	30	SA1110_D11
31	SA1110_A15	32	SA1110_D10
33	GND	34	SA1110_D9
35	+3.3V	36	SA1110_D8
37	SA1110_A16	38	SA1110_D7
39	SA1110_A17	40	SA1110_D6
41	SA1110_A18	42	SA1110_D5
43	SA1110_A19	44	SA1110_D4
45	SA1110_A20	46	SA1110_D3
47	SA1110_A21	48	SA1110_D2
49	SA1110_A22	50	SA1110_D1
51	SA1110_A23	52	SA1110_D0
53	SA1110_A24	54	GND
55	SA1110_A25	56	+5V
57	GND	58	nSA1110_CAS0*
59	+5V	60	nSA1110_CAS1*

Table 2.24: Expansion connector (CN15)

Pin	Signal	Pin	Signal
1	SA1110_A0	2	nSA1110_RST_OUT*
61	nSA1110_OE*	62	nSA1110_CAS2*
63	nSA1110_WE*	64	nSA1110_CAS3*
65	SA1110_MCP_SFRM	66	SA1110_D31
67	SA1110_MCP_SCLK	68	SA1110_D30
69	SA1110_MCP_RXD	70	SA1110_D29
71	SA1110_MCP_TXD	72	SA1110_D28
73	SA1111_SPI_RXD	74	SA1110_D27
75	SA1111_SPI_TXD	76	SA1110_D26
77	SA1111_SPI_SFRM	78	SA1110_D25
79	SA1111_SPI_SCLK	80	SA1110_D24
81	SA1111_GPIO0	82	SA1110_D23
83	GND	84	SA1110_D22
85	+3.3V	86	SA1110_D21
87	SA1110_GPIO2	88	SA1110_D20
89	SA1110_GPIO3	90	SA1110_D19
91	SA1111_GPIO14	92	SA1110_D18
93	GND	94	SA1110_D17
95	GND	96	SA1110_D16
97	nSA1110_CS1*	98	+3.3V
99	nSA1110_CS2*	100	GND

*Active low

Recommend I/O physical addresses from 0x1A80 0000h to 0x1AFF FFFFh which are located at SA-1110 static bank select 3.

2.3 Peripherals Connection

The RISC/Windows CE combination is good for purposed applications. However, it means at the same time that this kind of platform could not be the same as ordinary personal computers. This section provides a reference for connecting peripherals.

2.3.1 LCD Display

PCM-7130 supports both active and passive LCD displays. Nevertheless, the specifications of various LCD diverse substantially. Hereby a list is given to show those LCD supported by PCM-7130. The newest supporting list will be included in a progressive technical reference by Advantech. Please contact with local Advantech representatives or surf the website of Advantech: <http://support.advantech.com>

The PCM-7130 supports

- PrimeView 6.4" VGA TFT LCD

PD064VT2T1

- Nan-ya 7.4" VGA DSTN LCD

LCBLDT163M9T

- Unipac 10.4" SVGA LVDS TFT LCD(UB104S01-1)

2.3.2 CRT Display

The PCM-7130 supports display on CRT monitors. In addition, it can also give dual view on CRT and LCD display. Refer to the section 1.3 for the related information.

2.3.3 Touchscreen

The default touchscreen control and connector are for 4-wire resistive touchscreen.

2.3.4 USB Host

The USB host port on the PCM-7130 is USB 1.1 compatible. The default Windows CE.NET and Linux on board support USB keyboards and mice. To connect other devices it may take customization on the Windows CE.

2.3.5 USB Client

The USB client port is used for data synchronization between PCM-7130 and master devices (or server devices). The USB client cable enclosed in the package is used for this purpose.

2.3.6 RS-232/RS-485 COM Port

There are 3 serial ports on the PCM-7130. The COM1 has a DB-9 connector. On the other hand, the COM2 and COM3 (RS-232 and RS-485) share the same 14-pin header.

2.3.7 DI/DO

There are 8-channel digital input and 8-channel digital output on the PCM-7130. They can be used for simple on/off control. The high level voltage is 3.3V.

Warning! *Be careful when these DI/DO are used. Surge or over voltage may damage the circuits.*



Windows CE.NET on the PCM-7130

This chapter details the Windows CE.NET operating system on the PCM-7130.

Sections include:

- Starting PCM-7130
- Windows CE.NET utility on the PCM-7130
- PCM-7130 Networking
- Intel Persistent Storage Manager (IPSM)
- Application Program Development
- Advantech Windows CE.NET standard pack

Chapter 3 Windows CE on the PCM-7130

3.1 Introduction

The PCM-7130 is a single board platform that integrates complete I/O and Windows CE.NET operating system. The Windows CE is a compact OS that occupies less storage space or system resources compared with other operating systems such as Windows NT or Windows XP. By its modular nature, it is possible to choose those functions that are useful for specific application. Not only reducing the system resources required, it also reduces start-up time. In the field of embedded applications, this is an appealing feature because the impact of downtime would be minimized. Furthermore, the small storage space it needs makes OS on solid-state disk possible, which implies higher robustness to harsh environments.

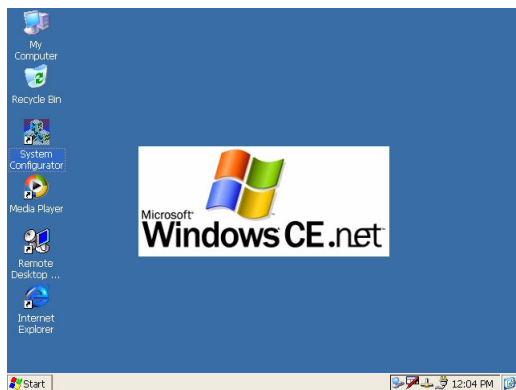


Figure 3.1: Windows CE.NET on the PCM-7130

3.2 PCM-7130 Utilities

There are several useful utilities built in the standard Windows CE OS of the PCM-7130:

3.2.1 Soft-keyboard

Besides using ordinary keyboards, a software keyboard is embedded in the standard PCM-7130 OS. Upon boot-up, a small keyboard icon would appear on the status bar. Tap this icon by the stylus to activate/hide this soft-keyboard.

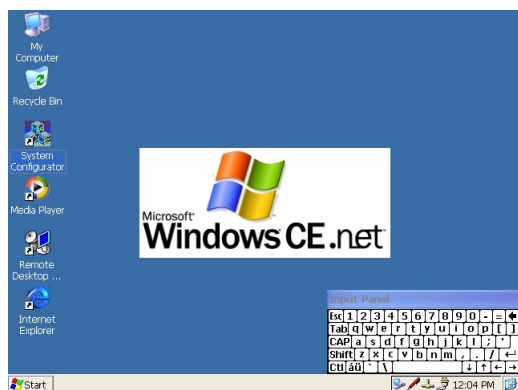


Figure 3.2: Soft-keyboard

3.2.2 Regflash

The utility "Regflash" is a convenient tool to save, overwrite or delete registry data, as well as erase the content of IPSM folder. From the Windows CE status bar, tap "Start/Run". Use the soft-keyboard to type "regflash" command in the command text box and press "OK".

*Note: Please be careful using this utility "Regflash".
This utility is able to overwrite all registry data.*

There are four selections here: Save to Flash, Delete from Flash, Save to CF Disk, Erase IPSM. Choose the options you want and press "Save" button to proceed. "Save to Flash" option was used to save the registry setting to on board flash rom. In contrast, "Delete from Flash" option was intended to erase the on board registry data. "Save to CF Disk" option would save the registry data to Compact Flash Card as a file "wince.reg". "Erase IPSM" option erase the IPSM region of the on board flash.

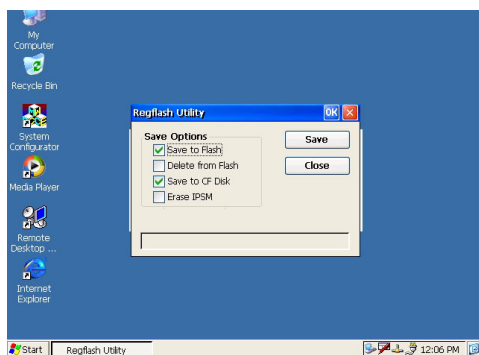


Figure 3.3: Regflash

It is important to keep the power normal during "Save to Flash" process. If the power break down during the registry saving process, then the registry would be lost and corrupt. On the next time you turn on PCM-7130, the system would load the default registry setting in the Windows CE image file

3.2.3 System Configurator

Double click the icon of System Configurator on the desktop to open the PCM-7130 utility. We would illustrate the functions in different pages of the utility in the following sections.

3.2.3.1 General

The memory information including DRAM, CF Disk and IPSM FLASH are displayed in the General page. And the version of installed software was indicated here as well, including windows CE, bootloader, registry and this Configurator.

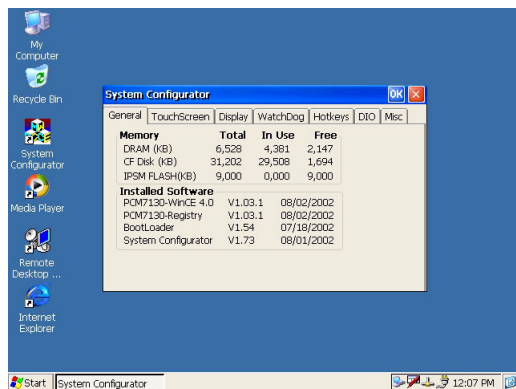


Figure 3.4: General information

3.2.3.2 Touchscreen

The Touchscreen page provides the calibration function. Click the "calibration" button, the "Stylus Properties" windows would appear. Then click "calibrate" button in the Advantech Touchscreen Properties window to enter calibration process. In the calibration process, user taps on the center of the target on the screen then the target will move to the next position. After calibration, press "OK" to leave Advantech Touchscreen Properties window, and then the Regflash utility process would automatically start to save the registry setting.

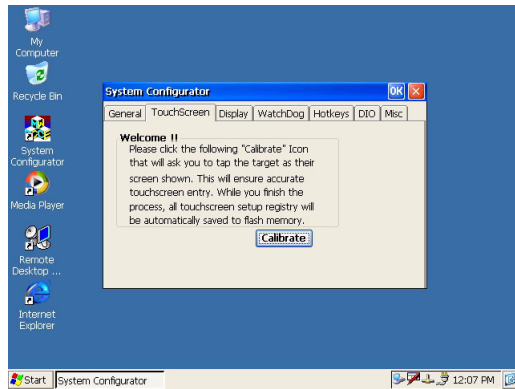


Figure 3.5: Touchscreen calibration

3.2.3.3 Display

From time to time it is unnecessary to turn on the display attached to the PCM-7130 all the day. The Display page of the Configurator provides several frequently used functions such as turning off the LCD and backlight to elongates the display repair period, adjusting brightness or contrast. For example, if the user wants the backlight turn-off setting function, he can press "setting" button. Then the backlight page will appear on the screen. Besides, user can click the "Off Now" button to turn off the backlight of the display panel immediately without waiting. Once the backlight was turned off, there were three inputs to turn it on: (1) mouse; (2) keyboard; (3) touch screen; user can use any one of them to turn on the display.

The lower "Brightness" and "Contrast" blocks have scroll bars by which users can tune brightness level of TFT LCD or the contrast level of passive matrix LCD.

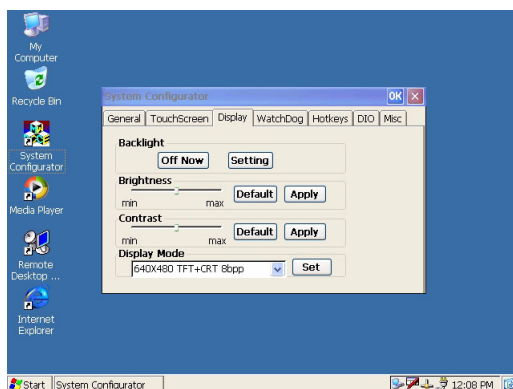


Figure 3.6: Display controls

The lowest block is “Display Mode”. The PCM-7130 supports 10 display modes including:

- VGA (640 x 480) TFT LCD and CRT display, with 8 bpp color depth for each
- VGA TFT LCD display with 16 bpp
- VGA CRT display with 16 bpp
- SVGA (800 x 600) TFT LCD display with 16 bpp
- SVGA CRT display with 16 bpp
- VGA TFT LCD and NTSC TV display, 8 bpp for each
- 672 x 436 NTSC TV display with 16 bpp
- VGA DSTN LCD display with 16 bpp
- VGA TFT LCD and PAL TV display, 8 bpp for each
- VGA PAL TV display with 16 bpp

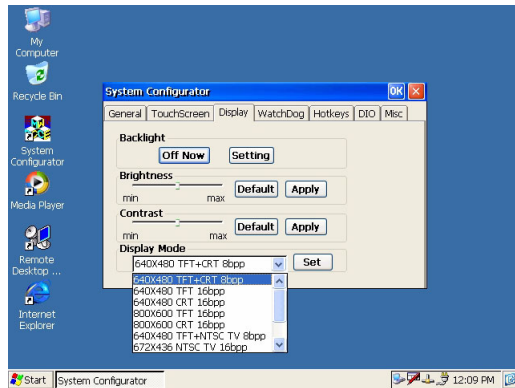


Figure 3.7: Display mode setting

- Note:**
1. VGA TFT LCD and CRT display is the default setting of the PCM-7130. This will facilitate users to develop AP or products if the LCD has not been determined. However, it is recommend to change the display mode because 8 bpp color depth may not be appreciated for most users.
 2. As new display mode is set, the PCM-7130 takes reset or reboot to activate new setting.

3.2.3.4 WatchDog timer

It is important in industrial applications that the control systems are rarely crashed, or are capable of self-reset if they are halted somehow. The watchdog timer is therefore used in the PCM-7130 to provide automatic reset. There is a timer inside the watchdog timer. The PCM-7130 should clear the timer within a pre-set time interval periodically. If the timer was not cleared, the timer would assume the system to be halted and generate a reset. The watchdog timer in the PCM-7130 provides eight different time intervals: 2 seconds, 5 seconds, 10 seconds, 30 seconds, 60 seconds, 2 minutes, 5 minutes and 10 minutes. Choose the appropriate time interval, and then press "Enable" button to enable the watchdog function. The "REBOOT" button provide the warm boot function to reboot the device.

The RTC TIME region of the page shows the time of watchdog timer (DS1670) and system time. The user can press "Start" button to show the current time.

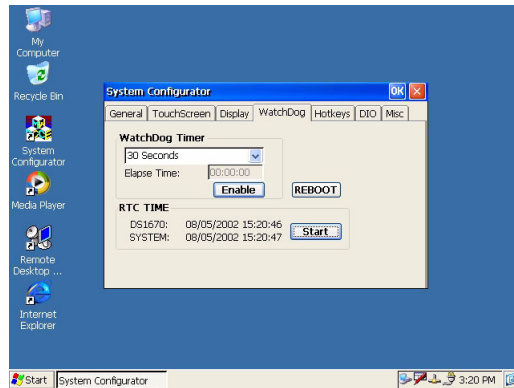


Figure 3.8: Watchdog timer

3.2.3.5 Hotkey

8 GPIO are mapped to 8 push-buttons as hotkeys, the defaults are:

Hot Key 1: invokes Windows Explorer

Hot Key 2: invokes Advantech homepage

Hot Key 3: invokes System Configurator

Hot Key 4: invokes Windows Media Player

Hot Key 5: invokes Control Panel

Hot Key 6: invokes Command Line environment

Hot Key 7: invokes touchscreen calibration

Hot Key 8: invokes ActiveSync

These settings can be freely revised by keying in new paths in the edit boxes.

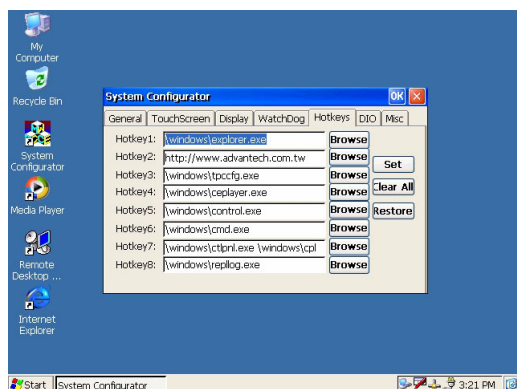


Figure 3.9: Default GPIO settings

3.2.3.6 DIO

There are 8 digital inputs and 8 digital outputs. This DIO page of the System Configurator can show their status. When the “Start” button is pressed, the 8 DI will try to retrieve external inputs, then those pins having positive inputs will mark respective radial buttons inside the “Digital Input Status” block, others will make their radial buttons empty.

On the other hand, when users use mouse, finger or stylus to check some of the 8 check boxes, the level of the related DO pins will be changed to positive level. The DO pin status will sustain until users change them again.

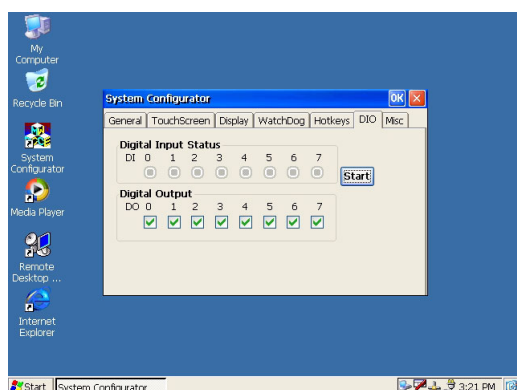


Figure 3.10: DI/DO verification

3.2.3.7 Miscellaneous

The Misc page provides several functions as described below. The "Registry" block provides registry save and registry view function. The "A. Sync" button invokes ActiveSync to the host computer. The "reset" button manually resets the keyboard/mouse for hot-plug keyboard/mouse. The "HTTP Server Root" block was used to specify the root directory of http server. The default directory is "\\windows\\wwwpub", user can specify another directory by type the directory in the edit box and press "Set" button. The new setting would become effective after the system reboot. The "CF Disk Folder Name" block specifies the folder name of the storage card inserted. The default name is "Storage Card". user can specify another directory by type the directory in the edit box and press "Set" button. The new setting would become effective after the system reboot. The "SMC MAC ID" block shows the network MAC address. The "COMM" block provides the communication functions, including IPConfig and Pinging Yahoo.

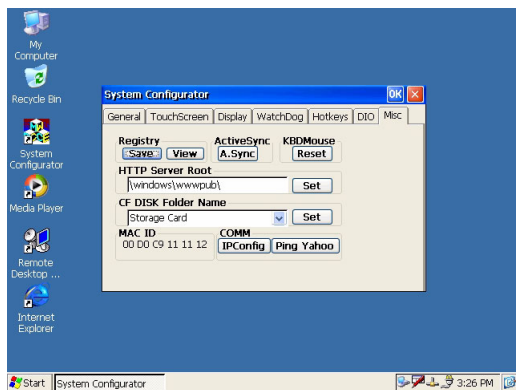


Figure 3.11: Miscellaneous settings

3.2.4 Reboot

The utility "Reboot" is a convenient tool to reset the system. From the Windows CE status bar, tap "Start/Run". Use the soft-keyboard to type "reboot" command in the command text box and press "OK".

The other way to reboot is clicking the "Reboot" button on the Watchdog page of the built-in utility System Configurator.

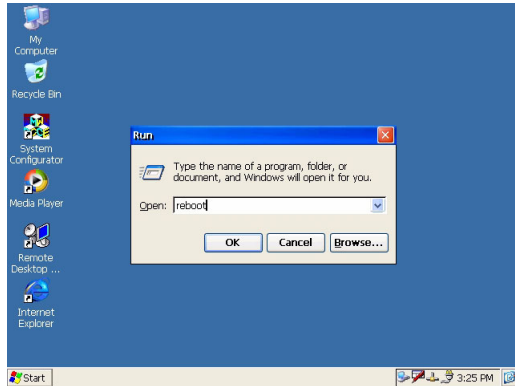


Figure 3.12: Reboot the system

3.2.5 Startup execution

The PCM-7130 has a useful function call "Startup execution". After the system boot up, the startup execution function would automatically perform. This function is useful for control system to do the initialization processes or some other programs. In PCM-7130, there are two ways to perform "Startup" function.

Method 1:

Step1: Create "startup" directory in Compact Flash or in "\IPSM\".

Step2: Copy executable files to "startup" directory which is created in Step 1.

Example:

We copy two executable files "Upgrade.exe" and "Notepad.exe" in "\IPSM\Startup", and then reboot the system. After the system boot up, the two executable file would be automatically execute.

Method 2:

Step1: The same as that in Method 1.

Step2: Create a file called "startup.ini" in "startup" directory. Type in the commands you want to execute after boot up in that file.

Example:

Create "Startup.ini" in "\IPSM\Startup" directory and reboot the system.

The content of startup.ini was listed below:

```
\windows\tty.exe
```

```
\windows\registry.exe
```

After the system reboot, "\windows\tty.exe" and "\windows\registry.exe" would be executed automatically.

Be sure that the two methods are independent, it means they can be used simultaneously.

3.2.6 Safemode

PCM-7130 utilities allow user to alter registry setting, and save it by either "regflash.exe" or the registry frame of the "Misc" page of the Configurator. But sometimes user may make some non-appropriate registry setting, and cause PCM-7130 fail to boot. In the circumstance, the easiest way to boot up PCM-7130 is to use the default registry setting from the WinCE image. When the PCM-7130 is booted up with the default registry setting, we say that it is working in "safemode". To enter "safemode", user must perform several steps as described below:

Step 1: Create a file whose filename is "safemode" or a directory whose name is "safemode" in the Compact Flash Card.

Step 2: Insert the Compact Flash Card into the PCM-7130.

Step 3: Turn on the power of PCM-7130.

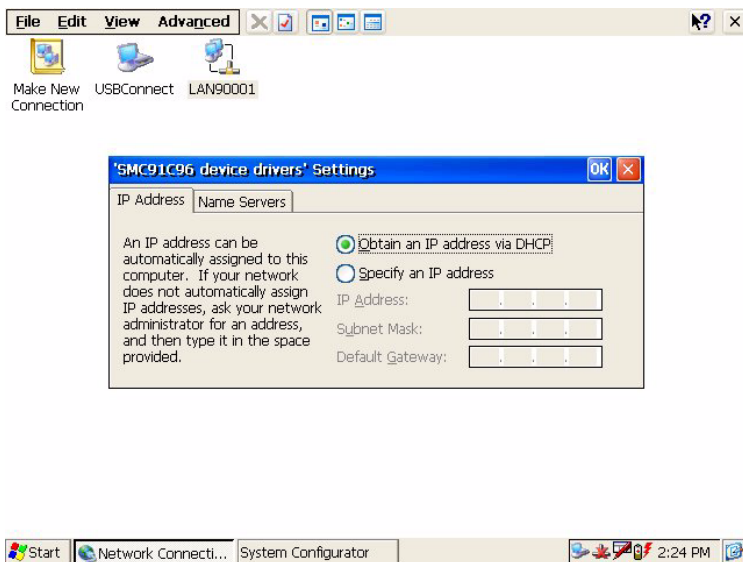
The registry searching sequence of the PCM-7130 was described in Appendix.

3.3 PCM-7130 Networking

3.3.1 Networking via Ethernet

The PCM-7130 is equipped with one 10Base-T Ethernet controller. To utilize it, change the device name when the PCM-7130 is first turned on.

1. Click "Start/Settings/Control Panel"
2. Double click "Network and Dial-up Connections"
3. This window will display all available connections. Right-click the connection icon users could disable, rename or modify IP addresses.
4. If the PCM-7130 is a node of a LAN with DHCP servers, it is now available.
5. If the PCM-7130 is a node of a LAN with fixed IP server, please consult with MIS to get specific IP address. Click "Start/Settings/Control Panel". Double click "Network" and update the IP address.
6. Use the "Regflash" utility to save this changed name.



3.3.2 Networking via serial port or USB cable

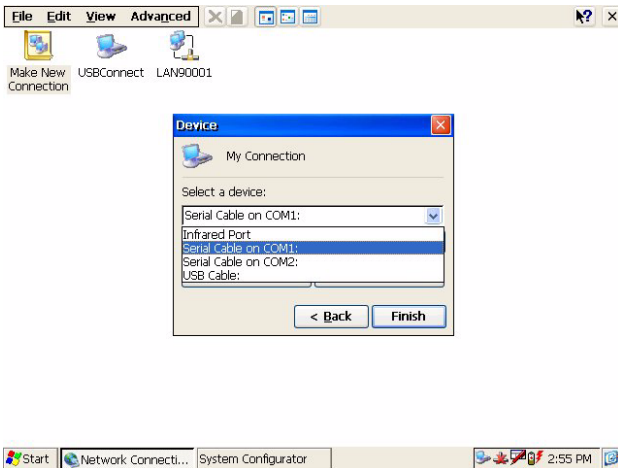
The PCM-7130 with built-in Windows CE supports serial and USB port connection to host computers. The host computer must install the Microsoft ActiveSync service offered by Microsoft. Use a null modem cable bundled with the PCM-7130 to connect the serial ports of the host computer and the PCM-7130. Or use the USB cable to connect the USB ports of them. Then activate ActiveSync service on the host computer. The host will automatically scan its serial ports and USB ports to make a connection.

Note: 1. Users should properly install the associated USB driver on the host computer while plugging in the PCM-7130 as a USB client device at the first time.

 2. The USB driver--*wceusbsh.inf* and *wceusbsh.sys*--are included in PCM-7130 support CD.

1. Make sure the Microsoft ActiveSync service and the Microsoft embedded Visual Tools are properly installed in the host PC.
2. Connect the two RS-232 ports of the host PC and the PCM-7130 by a null modem cable or use USB cable to connect the two USB ports of them.
3. If users are using the Microsoft eMbedded Visual Tools to develop Windows CE application runtimes, make sure the PCM-7130 SDK provided in the PCM-7130 support CD is also properly installed in the host PC.
4. Click "Start/Settings/Network and Dial-up Connections"
5. Make a new connection. As the dialogue box pops out, choose the default "Direct Connection" radial button. Click "Next".
6. Select whether to use "Serial Cable on COM1:" or "USB Cable" from the combo box, and click "Finish" to complete making new connection. It is recommended to keep the default settings of the ports connection.
7. Click "PC Connection" icon in the Control Panel. As the "PC Connection Properties" dialogue box pops up, change the connection to the newly made connection by clicking the "Change..." button.

8. If the ActiveSync service on the host PC has been activated, the above seven steps will make the PCM-7130 automatically try to connect the host, ;otherwise you can invoke "\\windows\\reglog.exe" to do the activesync connection.



3.3.3 Networking via PPP

The PCM-7130 with built-in Windows CE supports PPP protocol. To setup and utilize it, follow the steps below:

1. Click "Start/Settings/Network and Dial-up Connections"
2. Make a new connection. As the dialogue box pops out, choose the "Dial-Up Connection". Click "Next".
3. Click "Configure" to setup the device according to the specification of your modem, and then click "OK" on the top-right corner of the window.
4. Click "Next". Input the telephone number in the "Phone Number" window. Press "Finish" to complete the setup process.
5. Turn on your modem and use RS-232 cable to connect modem and com1 of PCM-7130.
6. Double click the connection you have made in Step 4. Key in the user name, password and domain for the dial-up connection and press "Connect".

3.3.4 Web browser

The PCM-7130 built-in Windows CE OS includes IESample. It can be used to browse web pages on World Wide Web via LAN or PPP.

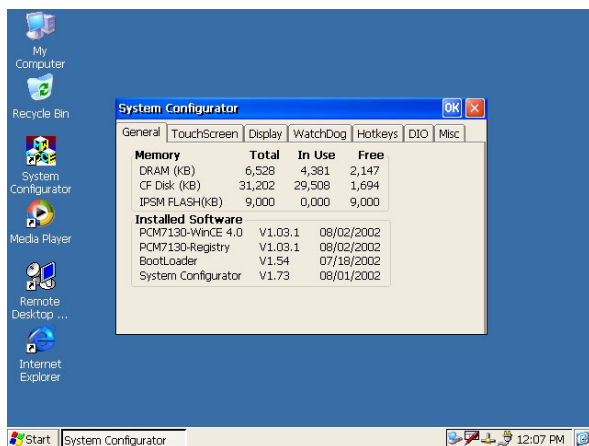
3.4 Intel Persistent Storage Manger (IPSM)

3.4.1 Introduction to Intel Persistent Storage Manger

Intel Persistent Storage Manager was designed and developed specifically as an enhancement to Microsoft Windows CE operating systems. PSM eliminates extra disk-like storage such as storage cards, redundant RAM and ROM.

3.4.2 IPSM in PCM-7130

PCM-7130 uses Intel Persistent Storage Manger to utilize the free space of flash rom for persistent storage. The IPSM region in the system is locate in "\IPSM" directory. Any file or directory stored in "\IPSM" directory would be keep persistently, even if the power of PCM-7130 was turned off. The user can store software or data in \IPSM rather in Compact Flash Card to avoid inconvenience.



3.5 Application Program Development

The PCM-7130 is bundled with built-in Windows CE operating system. In real applications users need to execute various application programs on it. However, unlike its other family the Windows CE is a hardware-dependent operating system. That is to say, Windows CE application programs are only portable in the source code level. Users must rebuild the runtime file for a different Windows CE platform even though the source code may not be changed at all.

3.5.1 System requirements

- Intel Pentium-90 CPU or more advanced
- Microsoft Windows 2000 Professional or Windows NT Workstation 4.0
- Microsoft eMbedded Visual Tools 3.0
- Platform SDK for PCM-7130 (bundled in the standard PCM-7130)
- 64MB DRAM
- CD-ROM drive
- Monitor with VGA resolution at least
- Mouse
- 200MB free hard disk space at least
- Connection to the same LAN as the PCM-7130 if LAN is used for development PCM-7130
- PCM-7130
- Connection to the same LAN as the host PC if LAN is used for development
- Null modem cable (bundled in the standard PCM-7130)
- USB cable (bundled in the standard PCM-7130)

3.5.2 Building Windows CE runtime

By the platform SDK bundled with the standard PCM-7130, users can build the Windows CE runtime by the eMbedded Visual Tools.

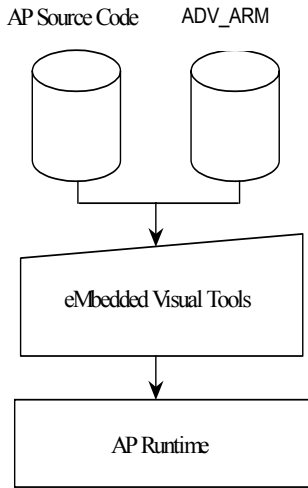


Figure 3.13: Flow-chart Windows CE runtime

3.5.3 Running your application programs

Use the Activesync function to put your application programs onto the PCM-7130 platform (reference 3.3). Users can run your application with startup execution (reference 3.2.5).

3.5.4 WDT Modules

PCM-7130 is targeted to be the embedded device for web-enabled and data-acquisition systems. It is built-in with Watchdog timer and LCD on-off control. Users can access these resources by writing windows programs with WIN32 API. PCM-7130 is built-in the WDT driver to allow users to enable/disable Watchdog timer and LCD on-off control. Users should use WIN32 APIs to access them. The driver name is "WDT1:". The programmers must open this driver before using the resources. Then programmers could use DeviceIOControl functions to enable/disable Watchdog timer and LCD on-off control. At most 5 applications can access watchdog timer simultaneously. The DeviceIOControl function is following:

- DeviceIoControl

This function sends a control code directly to a specified device driver, causing the corresponding device to perform the specified operation.

```
BOOL DeviceIoControl(  
HANDLE hDevice,  
DWORD dwIoControlCode,  
LPVOID lpInBuffer,  
DWORD nInBufferSize,  
LPVOID lpOutBuffer,  
DWORD nOutBufferSize,  
LPDWORD lpBytesReturned,  
LPOVERLAPPED lpOverlapped );
```

- Parameters

hDevice

[in] Handle to the device that is to perform the operation. Call the CreateFile function to obtain a device handle.

dwIoControlCode

[in] Specifies the control code for the operation. This value identifies the specific operation to be performed and the type of device on which the operation is to be performed. No specific values are defined for the dwIoControlCode parameter. However, the writer of a custom device driver can define IOCTL_XXXX control codes, per the CTL_CODE macro. These control codes can then be advertised, and an application can use these control codes with DeviceIoControl to perform the driver-specific functions.

lpInBuffer

[in] Long pointer to a buffer that contains the data required to perform the operation.

This parameter can be NULL if the dwIoControlCode parameter specifies an operation that does not require input data.

nInBufferSize

[in] Size, in bytes, of the buffer pointed to by lpInBuffer.

lpOutBuffer

[out] Long pointer to a buffer that receives the operation's output data.

This parameter can be NULL if the dwIoControlCode parameter specifies an operation that does not produce output data.

nOutBufferSize

[in] Size, in bytes, of the buffer pointed to by lpOutBuffer.

lpBytesReturned

[out] Long pointer to a variable that receives the size, in bytes, of the data stored into the buffer pointed to by lpOutBuffer.

The lpBytesReturned parameter cannot be NULL. Even when an operation produces no output data, and lpOutBuffer can be NULL, the DeviceIoControl function makes use of the variable pointed to by lpBytesReturned. After such an operation, the value of the variable is without meaning.

lpOverlapped

[in] Ignored; set to NULL.

- Return Values

Nonzero indicates success. Zero indicates failure. To get extended error information, call GetLastError.

There are 7 control codes for the operation codes in the WDT1 driver:

1. IOCTL_ENABLE_WDT (0x1001):

Enables the Watchdog timer on your application. Your application must trigger to Watchdog timer by IOCTL_ACCESS_WDT interface during specified period, otherwise the device will reboot automatically

lpInBuffer : unused.

nInBufferSize: unused.

lpOutBuffer: unused.

nOutBufferSize: unused.

2. IOCTL_DISABLE_WDT (0x1002):

Disable the Watchdog time on your application.

lpInBuffer : unused.

nInBufferSize: unused.

lpOutBuffer: unused.

nOutBufferSize: unused.

3. IOCTL_GET_WDTPERIOD (0x1003):

lpInBuffer :unused.

nInBufferSize: unused.

lpOutBuffer: the DWORD pointer to your Watchdog time setting. The unit is mini-second. Its value should be greater 1000. The default setting is 5000 mini-seconds.

nOutBufferSize: unused.

4. IOCTL_SET_WDTPERIOD (0x1004):

lpInBuffer : the DWORD pointer to your Watchdog time setting. Its value should be greater 1000. The unit is mini-second. If your application open the WDT driver, the default Watchdog Time is set to 5000 mini-seconds.

nInBufferSize: unused.

lpOutBuffer: unused.

nOutBufferSize: unused.

5. IOCTL_ACCESS_WDT (0x1005):

Your application must trigger the Watchdog once during the your Watchdog timer period. If your application has not trigger at the specified period, the device will reboot automatically.

lpInBuffer :unused.

nInBufferSize: unused.

lpOutBuffer: unused.

nOutBufferSize: unused.

6. IOCTL_GET_SCREENOFFTIME (0x1006):

lpInBuffer :unused.

nInBufferSize: unused.

lpOutBuffer: the DWORD pointer to your screen off time if user-interface idled. The unit is mini-second. If the value is 0, screen-off function is disabled.

nOutBufferSize: unused.

7. IOCTL_SET_SCREENOFFTIME (0x1007):

lpInBuffer : the DWORD pointer to your screen off time if user-interface idled. The unit is mini-second. If the value is 0, screen-off function is disabled.

nInBufferSize:unused.

lpOutBuffer: unused.

nOutBufferSize: unused.

8. IOCTL_SET_SCREENOFF (0x1010):

Set the LCD power off immediately.

lpInBuffer : unused.

nInBufferSize: unused.

lpOutBuffer: unused.

nOutBufferSize: unused.

Examples:

```
#define IOCTL_ENABLE_WDT 0x1001
#define IOCTL_DISABLE_WDT 0x1002
#define IOCTL_GET_WDTPERIOD 0x1003
#define IOCTL_SET_WDTPERIOD 0x1004
#define IOCTL_ACCESS_WDT 0x1005
#define IOCTL_GET_SCREENOFFTIME 0x1006
#define IOCTL_SET_SCREENOFFTIME 0x1007

HANDLE m_hWDT=NULL;
TCHAR szClassName[60];
...
// assign the WDT driver name
wsprintf(szClassName, TEXT("WDT1:"));
// Open the DIO driver
m_hWDT = CreateFile(szClassName, GENERIC_READ | GENERIC_WRITE, 0,
NULL,
                OPEN_EXISTING, FILE_ATTRIBUTE_NORMAL, NULL);
if ( m_hWDT == INVALID_HANDLE_VALUE ) {
    DebugMsg(CString("WDT driver fail"));
    return;
}
...
DWORD  dwTemp;
DWORD  nPeriod=10000;
// Set the Watchdog Timer as 10 seconds (10000 mini-seconds)
DeviceIoControl(m_hWDT, IOCTL_SET_WDTPERIOD, &nPeriod, 4, NULL, 0,
&dwTemp, NULL);
// Enable the Watchdog timer
DeviceIoControl(m_hWDT, IOCTL_ENABLE_WDT, NULL, NULL, NULL, 0,
&dwTemp, NULL);
While (1) {
    // do your job here...
    Sleep(8000);
    DeviceIoControl(m_hWDT, IOCTL_ACCESS_WDT, NULL, NULL, NULL, 0,
&dwTemp, NULL);
}
DeviceIoControl(m_hWDT, IOCTL_DISABLE_WDT, NULL, NULL, NULL, 0,
NULL, NULL);
CloseHandle(m_hWDT);
```

3.5.5 DIO Modules

PCM-7130 has 8 DI(Digital Input), 8 DO(Digital Output). Users can access these resources by writing windows programs with WIN32 API. PCM-7130 is built-in the DIO driver to allow users accessing DI and DO values. Users should use WIN32 APIs to access them. The driver name is "DIO1:". The programmers must open this driver before using the resources. Then programmers could use DeviceIOControl functions to access DO and DI values. The function description of DeviceIOControl is illustrated in section 3.5.3.

There are 3 control codes for the operation codes in the DIO driver:

1. IOCTL_GET_DI(0x1002):

lpInBuffer : the pointer to the DI index. Its range is from 0 to 5.

nInBufferSize: unused.

lpOutBuffer: the pointer to the current DI value. Its value should be 0 or 1.

nOutBufferSize: unused.

2. IOCTL_GET_DO(0x1003):

lpInBuffer : the pointer to the DO index. Its range is from 0 to 5.

nInBufferSize: unused.

lpOutBuffer: the pointer to the current DI value. Its value should be 0 or 1.

nOutBufferSize: unused.

3. IOCTL_SET_DO(0x1005):

lpInBuffer : the pointer to the DO index. Its range is from 0 to 5.

nInBufferSize: the setting value. It must be 0 or 1.

lpOutBuffer: unused.

nOutBufferSize: unused.

Examples:

```
#define IOCTL_GET_DI 0x1002
#define IOCTL_GET_DO 0x1003
#define IOCTL_SET_DO 0x1005
```

```
HANDLE g_hDIO=NULL;
TCHAR szClassName[60];
...
// assign the DIO driver name
wsprintf(szClassName, TEXT("DIO1:"));
// Open the DIO driver
```

```

g_hDIO = CreateFile(szClassName, GENERIC_READ | GENERIC_WRITE, 0,
NULL,
OPEN_EXISTING, FILE_ATTRIBUTE_NORMAL, NULL);
if ( g_hDIO == INVALID_HANDLE_VALUE ) {
    DebugMsg(CString("DIO driver fail"));
    return; }

...

// Get the DO 2 value into nV
DWORD dwTemp;
DWORD nDO = 2;
int nV;
DeviceIoControl(g_hDIO, IOCTL_GET_DO, (LPVOID)&nDO, 4, (LPVOID)&nV, 4,
&dwTemp, NULL);
CloseHandle(g_hDIO);

```

3.6 Advantech Windows CE.NET standard pack

This section will describe detailed requirements on hardware support and Windows CE.NET component as below. Users can upgrade their OS image using the "Advantech Upgrade" tool to develop or upgrade the OS version.

Caution: This action maybe damaged the system,if you really need this function,please contact www.advantech.com/risc

3.6.1 Detailed requirements on hardware support

- WDT: provides sample code for period setting on manual
- Battery:
 - battery gauging
 - 25% low-battery warning event, adjustable
 - battery/DC-in/charging icons on status bar
- SSD:
 - higher priority to boot if the CF card contains bootable image
 - Hot swappable
- PCMCIA:
 - supports CF card with PCMCIA adapter as non-bootable storage card
 - supports Advantech WLAN cards
- PS/2:
 - supports keyboard, mouse and touchscreen simultaneously
 - keyboard/mouse will not interfere each other and the touchscreen
 - hot plug
- Serial ports: RS-485 has hardware data flow control ability
- USB host: supports keyboards/mice. Standard compatible item list should be the same as that of QE

3.6.2 Windows CE.NET Components

Component	Sub-comp.	
Basic kernel, drivers & UI		V
ActiveSync	File Sync	V
	Inbox Sync	X
	Pocket Outlook Data-base Sync	X
Active Template Library (ATL)		V
C library & runtime		V
COM/DOM	COM	V
	DCOM	X
SNMP		V
Lightweight Directory Access Protocol (LDAP)		V
Message queuing		V
SOAP reliable message protocol		V
MFC		V
Object EXchange protocol (OBEX)		V
Pocket Outlook Object Model (POOM) API		X
Simple Object Access Protocol (SOAP) toolkits	Client	V
	Server	V

XML 3.0	XML core services & Document Object Model (DOM)	V
	XML minimal parser	X
Games	Free cell	X
	Solitaire	X
Help		V
Inbox		X
Remote Desktop Protocol (RDP)		V
Terminal emulator		V
Windows messenger		V
Wordpad		V
Networking	Network bridging	V
	Real-time Communication (RTC) client API	V
	Universal Plug and Play (UpnP)	V
LAN	WLAN zero configuration & 802.1x	V
Personal Area Network (PAN)	IrDA	V
	Bluetooth	X
WAN	Dial-up Networking (RAS/PPP)	V
	VPN (PPTP)	V
	Telephony API (TAPI 2.0)	V
Server	Core server support	V
	FTP server	V

	Telnet server	V
	RAS server/PPTP server (incoming)	V
	Web server (HTTPD)	V
	ASP support	V
Browser	IESample 5.5	V
	Pocket IE	X
Multimedia	DirectMusic	V
	Digital right management	V
	Direct3D	V
	Direct Draw	V
	Direct Show	V
	Media player	V
	DVD-video	V
Authentication services (SSPI)		V
Cryptography		V
Localization	English	V
	Chinese (S)(T)	X
	Japanese	X
	Korean	X

Registry Searching Sequence

Appendix A Registry Searching Sequence

A.1 Appendix A Registry Searching Sequence

The following diagram demonstrates the sequence which the PCM-7130 follows to search for registry during bootup period.

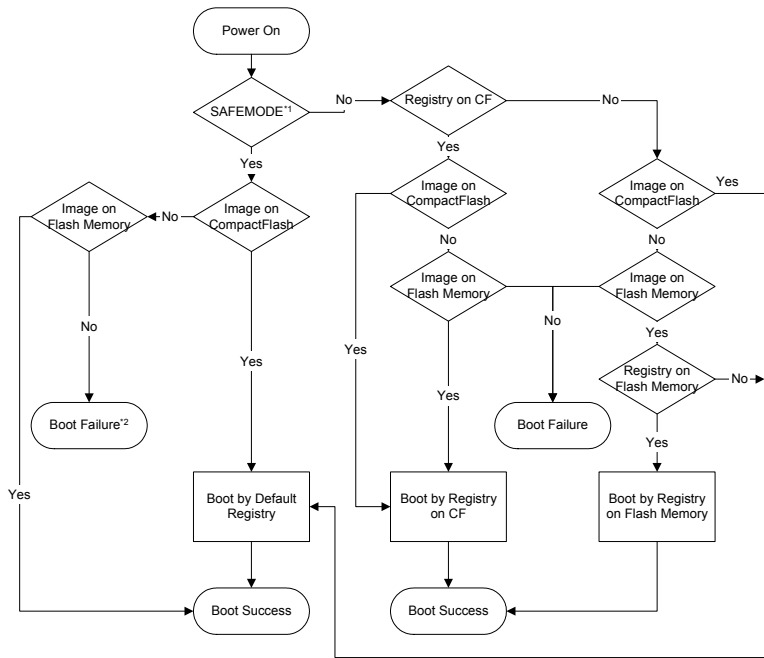


Figure A.1: A.1 Registry Searching Sequence

Passive Matrix LCD Display

Appendix B Passive Matrix LCD Display

B.1 Appendix B Passive Matrix LCD Display

As mentioned in Section 1.3 of Chapter 1, the PCM-7130 supports passive matrix LCD display such as STN/DSTN LCD panels. However, there is a power input, the V_{contrast} , varies according to different STN LCD. Therefore every system having STN LCD display must provide different V_{contrast} to its specific mating panel.

The PCM-7130 is verified to support *Nan-ya 7.4" VGA DSTN LCD (LCBLDT163M9T)*. However, it takes a piece of adapter board which boosts the normal 3.3V on the PCM-7130 to higher level, and serve it to the LCD as V_{contrast} max = 26.8 V, min = 22.3 V, default = 24.4 V. This voltage can be adjusted by system configurator utility.

This piece of adapter board is mounted on the PCM-7130 as shipped to users. With it users can connect PCM-7130 to either TFT LCD or DSTN LCD specified above.

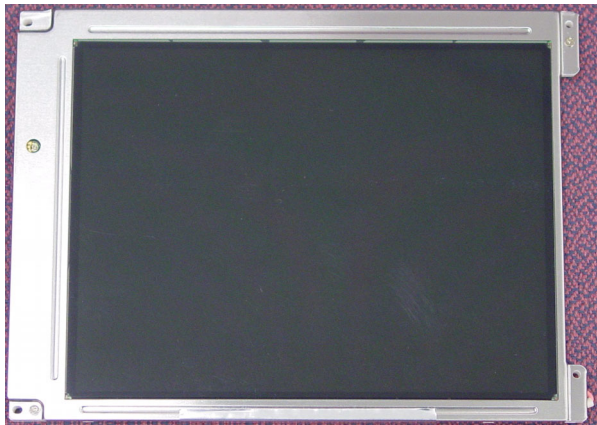


Figure B.1: 6.4" LCD

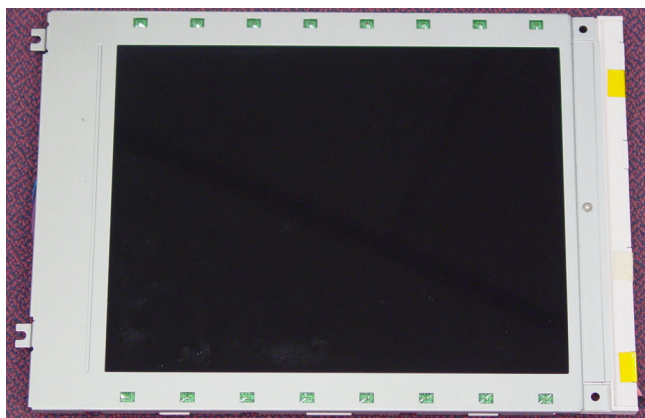


Figure B.2: 7.4" LCD



Figure B.3: 10.4" LCD

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